ANGLER HARVEST SURVEY

KATHLEEN LAKE 2004

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Key Findings

- Anglers spent an estimated 2,265 hours of angler effort on Kathleen Lake in the summer of 2004. This is 0.67 hours per hectare, a mid range value for popular Yukon fisheries. This level of effort has remained remarkably consistent over 25 years and 6 surveys.

- Angler success, as measured by the number of lake trout caught per hour of angling, was average for other Yukon fisheries surveyed to date and has also remained stable over 25 years. Arctic grayling success was good, while rainbow trout success was very low, reflective of their low abundance in the lake. No anglers targeted kokanee in 2004 due to new regulations requiring their release.

- Almost all Arctic grayling were released, while lake trout retention rates were around the Yukon average at 31%.

- When considering summer and winter harvest in the lake and incidental mortality from catch and release, the total mortality of lake trout was 273 kg, slightly less than the estimated Optimal Sustainable Yield of 299 kg. When including harvest and mortality of lake fish in the Kathleen River, the total value jumps to 430 kg. There is considerable uncertainty around this last estimate.

- Results from this survey do not indicate issues with the lake trout population in Kathleen Lake. Regular monitoring of the fish population and angler harvest should continue on this important fishery. Work on refining estimates of productive capacity and the movements of trout between the lake and river will be important for maintaining this high quality fishery.

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Introduction

Angler harvest surveys, also called creel surveys, are conducted on a number of Yukon recreational fisheries each year. These surveys, in combination with other fish and fishery-related assessments, are used to determine if the harvest of fish from the lake is sustainable. Environment Yukon endeavors to conduct angler harvest surveys on key fisheries every 5 years or as angler patterns and management concerns dictate. Results of the survey directly contribute to management decisions that ensure fisheries are sustainable over the long term.

Kathleen Lake is a beautiful, medium sized (surface area of 3376 ha or 33.8 km^2), deep (55.2 meter average depth) lake located entirely within the boundaries of Kluane National Park (KNP) and within the traditional territory of the Champagne and Aishihik First Nations. The only vehicle access to the lake is through the Parks Canada day use area a short distance off the Haines Road about 23 kilometers south of Haines Junction. There is a boat launch and docks located in the day use area and a campground several hundred meters back from the lake. Fish species targeted in Kathleen Lake include lake trout, rainbow trout, Arctic grayling and kokanee salmon.

A Parks Canada angling licence is required and Parks Canada angling regulations apply. Fishery management and regulation is carried out in close cooperation with the Yukon government (YG) to provide consistency in regulation and management approaches. As such there is much cooperative study of the fishery and fish populations.

Kathleen Lake receives a moderate amount of angler effort for a Yukon lake of this size (Fish and Wildlife Branch unpublished data), which when combined with its importance as a fishery within Kluane National Park, has led to a creel survey approximately every 5 years to monitor angler patterns and trends. This is the fourth cooperative creel survey of Kathleen Lake since 1990, with survey design, management and analysis conducted by YG with financial support and cooperation of Parks Canada. Kathleen Lake has been previously assessed in 1999, 1995, 1990, 1981 and 1980. Results from surveys of the ice fishery conducted in 1980, 1981, 1991 and 2004 are also be presented here.

The survey was done to:

- determine how much time anglers spent fishing (effort);
- understand the characteristics of the fishery and patterns of use;
- measure success rate of anglers;
- measure the level of harvest in relation to the productive capacity of the lake;
- record biological information on harvested fish;
- provide anglers with information about regulations; and
- establish a fisheries management presence.

The creel contractor provided frontline contact with anglers and the public to communicate information and awareness of recent concerns over the crash of the kokanee salmon population within the Kathleen system. This crash led to 2004 regulation changes requiring the release of all kokanee salmon caught.

Harvest Regulations

Regulations in place for 2004 require the use of single barbless hooks and the mandatory release of all rainbow trout and kokanee salmon. Lake trout catch limits are 2 fish per day and in possession, with required release of all fish between 65cm and 100cm and only one fish in possession may be longer than 100cm. Arctic grayling catch limits are 4 fish per day and in possession, with required release of all fish between 40cm and 48cm and only one fish in possession may be longer than 48cm.

Methods

Survey

In 1990 the Yukon Government adopted survey methodology developed by the Ontario Ministry of Natural Resources (Lester and Trippel, 1985). Surveys consist of a field worker conducting face to face interviews with anglers on selected sample days throughout the summer. Anglers are asked a standard set of questions used to characterize the social and biological aspects of the fishery. Data gathered include:

- How much time did anglers spend fishing?
- What fishing methods did anglers use?
- How did anglers fish (boat, shore, etc...)?
- Were anglers guided?
- Where were anglers from?
- What type of visitor were anglers (day users, campers, etc...)?
- What kinds of fish were anglers trying to catch?
- How many fish did anglers catch?
- How many fish did anglers release?

Any additional information offered by anglers relating to any aspect of their experience is also recorded.

The field worker also collects biological data on the catch of cooperative anglers. Biological data gathered include: length (mm), mass (g), sex, maturity, the collection of an aging structure appropriate to the species, as well as the collection of stomachs for content analysis in the lab. Any additional information as to general health and condition of the fish is recorded by the field worker (e.g., abnormalities, disease, lesions).

Weather over the entire sample day is subjectively assessed by the field worker as to its effect on angling activity (no possible adverse effect, possible adverse effect, definite adverse effect).

Survey timing varies depending on management objectives, key species and the nature of the fishery, but typically runs from ice out in the spring until either just after Labour Day or to the end of September. The goal is to sample at least 20% of the total survey days. The survey is subdivided into several sub-periods, or strata, to better understanding changes in angler activity through the survey. This usually involves a division of the survey period into three or four seasonal strata which are further partitioned into weekends and weekdays. Sample days are allocated to each stratum while considering both a higher weighting for the strata with the higher projected angler use and a minimum number of samples for each stratum.

Sample days are 14 hours long, 8:00AM to 10:00PM. On sample days, all willing angling parties are interviewed by the field worker and angling parties that are observed but not interviewed are recorded.

Analysis

At the completion of the survey, the data are entered into the computer program CREESYS (1985) developed by the Ontario Ministry of Natural Resources. Data are analyzed using standard statistical methods. For fish that are sampled, age is determined by counting growth rings on the otolith (a small bone from the fish's head) and diet is determined by examining and the stomach contents.

Lake Productivity

The productivity of a lake determines the amount of fish that is produced annually and can guide how much harvest can be sustained. Estimates of lake productivity are calculated using average lake depth, the concentration of total dissolved solids, and the average annual air temperature at the lake. Ryder's morphoedaphic index (1974) is used and incorporated into Schlesinger and Regier's (1982) equation for calculation of maximum sustained yield (MSY) for all species. Calculation of MSY for lake trout assumes a biomass of 30% lake trout; where appropriate this may be replaced by most recent survey data. Following O'Connor (1982) and others, 15% of MSY provides an "optimum"

sustained yield (OSY) which maintains high quality fisheries on light to moderately exploited lakes.

2004 Kathleen Lake Survey

The survey began on May 17 (ice out) and concluded on September 30, 2004. Concurrent to this survey, we conducted an angler harvest survey of Kathleen River from the Haines Road bridge crossing just downstream Kathleen Lake and just outside the boundary of Kluane National Park (Foos 2007).

An access survey methodology was used, meaning the field worker was stationed at the day use area and boat launch (Figure 1) for the entire sample day and interviewed angling parties at the end of their fishing trip. Previous surveys and local knowledge show that almost all angler effort on Kathleen Lake originates from this location.

Figure 1. Location of Kathleen Lake angler harvest survey 2004.

The survey period was partitioned into 8 strata, weekends and weekdays in late May/June, July, August/early September and late September. Of the 137 day survey period, 27 days were sampled, resulting in a sampling effort of 20%.

Data analysis was divided into two parts. In the first part data was combined across all 8 strata, and in the second part results were compared between strata (see Appendix I). All data was analyzed at the party level.

Results of the 2004 Survey

Effort

We estimate a total of 2,265 hours of angler effort were expended over the 2004 period. This is 0.67 hours per hectare, a mid range value for popular Yukon fisheries. 737 anglers fished on Kathleen Lake for an average of 3.1 hours per angler. Over the period we surveyed, an average of 16.5 hours were fished by anglers each day.

Fishing Methods

Trolling was the most popular method of fishing on Kathleen Lake, followed by spin casting, fly casting and then combinations of methods (Table 1).

Table 1. Fishing methods, Kathleen Lake 2004.

Method of Fishing	Percent of Parties
Still	
Jig	
Drift	
Troll	44%
Spin Cast	34%
Fly Cast	11%
Other or Combination	11%

Methods of Access

Most anglers accessed Kathleen Lake fishery by motorboat. Shore access was also popular and some anglers used canoes, belly boats and rowboats to access the lake (Table 2).

Table 2. Angler access methods, Kathleen Lake 2004.

Access Method	Percent of Parties
Canoe	11%
Rowboat	2%
Motorboat	52%
Shore	31%
Bellyboat	4%

Guided Anglers

Fifteen percent of anglers were formally guided on Kathleen Lake (Table 3).

Table 3. Guided anglers, Kathleen Lake 2004.

Anglers	Percent of Parties
Guided	15%
Not guided	85%

Angler Origin

Most anglers were either local (from Haines Junction) or from Whitehorse (Table 4). Nearly a quarter was non-residents and most of these were European.

Table 4. Angler origin, Kathleen Lake 2004.

Angler Origin	Percent of Parties
Local	26%
Whitehorse	31%
Yukon	2%
Canada	11%
U.S.	8%
Other	22%

Visitor Type

A majority of anglers were day users, while most others stayed at the adjacent Parks Canada campground (Table 5).

Table 5. Angler visitor type, Kathleen Lake 2004.

User Type	Percent of Parties
Day users	62%
Camper – Park campground	34%
Camper – Crown Land	1%
Camper – Private campground	2%

Weather

Weather had a definite or possible adverse effect on 52% of the fishing days in 2004 (Table 6). Kathleen Lake can get very windy and become rapidly too wavy and dangerous for all but the largest of boats that are used to access the lake.

Table 6. Sample day weather, Kathleen Lake 2004.

Did Weather Effect Angling?	Percent of Parties
No Possible Adverse Effect	48%
Possible Adverse Effect	26%
Definite Adverse Effect	26%

Catch and Harvest

Arctic grayling were the most heavily caught species on Kathleen Lake in 2004, but the extremely low retention rate resulted in very few being harvested (Table 7). Lake trout were also caught in reasonable numbers and with a 31% retention rate were the most harvested species. Although rainbow trout may not be caught under Parks Canada regulations, we estimate that 3 were retained (based on observing one retention). No kokanee were caught during the survey.

Table 7. Angler catch and harvest, Kathleen Lake 2004.

Species	# Caught	# Kept	Retention Rate
Lake trout	447	137	31%
Rainbow trout	3	3	100%
Kokanee	0	0	n/a
Arctic grayling	965	16	2%

Estimated angler catch per unit effort (CPUE, the number of fish per angler hour) over the entire survey can reflect changes in the fishery because it incorporates effort and catch. Dramatic decreases in CPUE for a particular species could indicate problems in terms of the health or status of the fish species in question. However, relying on CPUE of anglers alone is not recommended – see the section entitled "Invisible Collapse" in the *Status of Yukon Fisheries 2010* (Environment Yukon, 2010) – anglers are very good at finding fish even when the population is in decline.

As expected, anglers who targeted a particular species were much more successful in catching this species than anglers that were not targeting the species (Table 8). Most anglers targeted lake trout (69%) and these anglers were responsible for 95% of the catch and 100% of the lake trout harvest. Twenty three percent of anglers were targeting Arctic grayling, and were responsible for 93% of the catch and 50% of the harvest. Relatively few anglers were targeting rainbow trout (4%) or kokanee (1%).

Table 8. Catch and harvest by anglers targeting specific species, Kathleen Lake 2004.

Species	Percent of Parties	Percent of Total Catch	Percent of Total Harvest
Kokanee	1%	No Catch	No Harvest
Rainbow trout	4%	100%	100%
Lake trout	69%	95%	100%
Arctic grayling	23%	93%	50%

Estimated angler success rates were determined for all anglers regardless of target species ('all anglers') and for those anglers who were targeting a specific species ('species anglers', Table 9). CPUE results are slightly above Yukon averages for lake trout and well above Yukon averages for Arctic grayling. Results are low for kokanee and rainbow trout, a reflection of their low abundance in the system.

Table 9. Estimated catch per unit of effort (fish/hour), Kathleen Lake 2004.

Species	All Anglers CPUE	Species Anglers CPUE
Kokanee	0.00	0.00
Rainbow trout	0.00	0.04
Lake trout	0.20	0.26
Arctic grayling	0.43	1.08

Ice fishing also occurs on Kathleen Lake. A combination of frequent patrols by Park wardens during the spring ice fishing season and voluntary reporting by local anglers resulted in an estimated minimum harvest of 22 lake trout (L. Freese, Parks Canada warden, unpublished data).

Biological Data

During the summer, 19 lake trout were sampled for biological data. The mean fork length was 479 mm, mean weight was 1338 g, and the mean condition factor was 1.22. This is a good condition factor (relationship between length and weight) for lake trout in Yukon and indicates "fat" fish. During the spring, 16 lake trout were sampled. These fish had a mean fork length of 445 mm and a mean girth of 226 mm. The majority of lake trout harvested were between 400 and 550 mm (Figure 2).

Ages were obtained from 18 lake trout in the summer creel. They averaged 15 years old and ranged from 6 to 28 years. Eight ages were available from the spring submissions averaging 20 years of age, ranging from 10 to 30 years. Because of the small sample sizes no robust conclusions may be drawn from this difference. The age structure of the sampled lake trout (not shown) appears to indicate a healthy population.

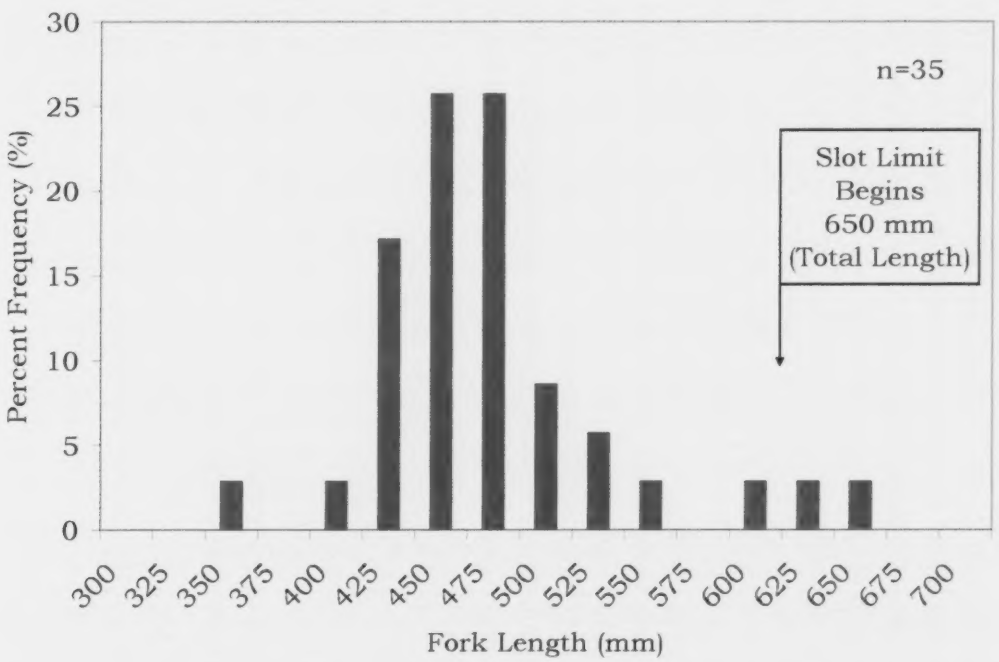

Figure 2. Lengths of lake trout caught by anglers, Kathleen Lake 2004.

Diet analysis was conducted on 15 lake trout stomachs. Of these, 4 were empty and the remaining 11 averaged 47% full. Snails were the most common diet item identified followed by unidentified fish (Table 10).

Table 10. Sampled lake trout stomach contents, Kathleen Lake 2004.

Stomach Contents	Percent Volume
Snails (*Limnaea sp.*)	48%
Unidentified fish	34%
Stoneflies (*Plecoptera sp.*)	7%
Round whitefish (*Prosopium cylindraceum*)	3%
Slimy sculpin (*Cottus cognatus*)	3%
Unidentified vegetation	3%
Snails (*Gyralus sp.*)	1%
Black flies (*Simulidae sp.*)	1%

There was 1 rainbow trout sampled for biological data. Its fork length was 392 mm and weight was 675 g. This results in a condition factor of 1.12. It was 4 years old and diet analysis is not available. Estimated weight of rainbow trout harvested by anglers over the summer (harvest estimate x mean weight) was 2 kg.

Comparison with Previous Surveys

Angler harvest surveys have previously been carried out on Kathleen Lake in 1999, 1995, 1990, 1981 and 1980. The surveys from the 1990s used a similar design and method and so are directly comparable with the 2004 survey results. The surveys in 1980 and 1981 were done over a different time period and so would need to be subset to allow comparison between similar periods (summer open water). Most of the discussion in this report will focus on the summer surveys.

Informal monitoring of the ice fishery was conducted by Park wardens in 2004; a spring ice fishing survey was conducted in 1991 and fall/ice fishery data was subset from the 1981 and 1980 surveys. These data are included where appropriate.

Effort

Estimated summer angler effort over the past 25 years and 6 surveys has been remarkably consistent. Results for 2004 were only slightly below the average of surveys to date, which may be a result of kokanee anglers not angling this year (Table 11). Angler effort in 1990 was much lower than the three most recent surveys. Osborne (1996) suggests this may have been due to poor weather (higher than normal winds and precipitation) and deficiencies in survey design and execution. Ice fishing effort has also remained relatively consistent at low levels over the years.

Table 11. Total estimated angler hours, Kathleen Lake 1980 – 2004.

Year	Summer Hours	Fall/Ice Hours
2004	2,265	Informally monitored: low
1999	2,835	
1995	2,377	
1991		494 (spring ice only)
1990	468	
1981	2,460	827
1980	2,308	463

Fishing Methods

Fishing methods have been similar between surveys since 1995 when we began collecting these data, with trolling and fly fishing slowly gaining popularity and a corresponding slight decline in spin casting.

Guided Anglers

There has been a steady increase in guided parties since these data began to be collected in 1995. There were no guided parties in 1995, 4% guided in 1999 and 15% in 2004.

Angler Origin

Angler origin, also collected since 1995, has remained relatively stable over the surveys, except there was an increase in the number of Europeans in 2004 (Table 12). Many of these anglers are guided, which helps explain the increase in number of guided parties.

Table 12. Origin of anglers (percent of parties), Kathleen Lake 1995 – 2004.

Origin	2004	1999	1995
Local	26%	30%	17%
Whitehorse	31%	32%	48%
Yukon	2%	0%	1%
Non-resident Canadians	11%	11%	5%
U.S.	8%	15%	16%
Other (usually Europeans)	22%	12%	13%

User Type

Visitor type shifted slightly towards day users in 2004 (62%), with a corresponding decline in the National Park campground users. These data have only been collected since 1995.

Weather

The field worker's subjective assessment of weather effects on angling activity over entire sample day indicates that summer 1999 had the nicest summer weather, while 2004 had the poorest (Table 13). Sample day weather data were not collected for surveys prior to 1995.

Table 13. Weather effects on angling activity (percent of parties), Kathleen Lake 1995 – 2004.

Effects	2004	1999	1995
No possible adverse effect	48%	80%	56%
Possible adverse effect	26%	15%	33%
Definite adverse effect	26%	5%	11%

Catch and Harvest

Catches of both kokanee and rainbow trout have declined over the years (Table 14). Kokanee were often retained at a higher level than other fish (Table 14 and 15). A few rainbow trout have been harvested in most years since 1991 even though their release is required by regulation. Lake trout catches are higher recently than they were in the mid 1990s and have returned to the level seen in the early 1980s. However, the retention rate is much lower now such that the number of lake trout harvested is not nearly as high. A lower retention rate for lake trout is a Yukon-wide phenomenon as anglers are releasing a larger

proportion of their catch due to awareness of the impact that angling can have on lake trout populations. The high number of Arctic grayling caught in 2004 can be attributed to guided European parties, which catch and release many grayling.

Table 14. Estimated angler catch, Kathleen Lake 1980 – 2004.

Species	2004	1999	1995	1990*	1981	1980
Kokanee	0	35	109	0	334	131
Rainbow trout	3	9	7	13	12	17
Lake trout	447	369	113	90	448	244
Arctic grayling	965	202	94	109	180	265
Round whitefish	0	0	0	0	1	1

*very low activity in 1990

Table 15. Estimated angler harvest, Kathleen Lake 1980 – 2004.

Species	2004	1999	1995	1990	1981	1980
Kokanee	0	18	104	0	278	107
Rainbow trout	3	3	0	3	n/a	n/a
Lake trout	137	184	69	53	400	223
Arctic grayling	16	71	45	10	112	244
Round whitefish	0	0	0	0	n/a	n/a

NOTE: Since 1991, under the National Park Fishing Regulations, rainbow trout caught in Kathleen Lake must be released.

The 2004 data suggest stable or increasing angling success for all fish species targeted in Kathleen Lake other than kokanee salmon (Table 16). Kokanee have demonstrated a downward trend over the years, and were essentially not angled for in 2004 as a result of Parks Canada's implementation of a zero retention limit for kokanee and discouraging anglers from targeting these fish. This decline in angling success corresponds with dramatic population declines observed on the spawning grounds for the past several years. The cause is not yet known, but is being investigated.

Rainbow trout CPUE has always been low on Kathleen Lake, reflecting this species' low abundance in the system. Lake trout CPUE in 2004 was good and increased over the 1990s results to early 1980s levels. This may indicate long term stability in the lake trout population. Arctic grayling CPUE was much higher in 2004 than in past surveys. This is related to an increasing number of anglers (23%) targeting grayling this year rather than reflective of increased

grayling abundance. This may partially be a result of anglers not being able to fish for kokanee.

Table 16. Estimated catch per unit of effort (fish/hour), Kathleen Lake 1980 – 2004.

Species	2004	1999	1995	1990	1981	1980
Kokanee	0.00	0.01	0.05	0.04	0.14	0.06
Rainbow trout	0.001	0.003	0.003	0.030	0.005	0.007
Lake trout	0.20	0.13	0.05	0.19	0.18	0.11
Arctic grayling	0.43	0.07	0.04	0.23	0.07	0.12

Fall/ice fishing catches

Partial surveys, estimations and information from park warden patrols have been gathered sporadically over the years to quantify late fall and winter ice fishing catch and harvest (e.g. Wickstrom 1982). A significant decline in harvest through the ice has been seen (Table 17). It should be noted that the 2004 estimate is a minimum based on samples submitted to and gathered by wardens. The level of harvest through the ice is therefore thought to be low when compared to the open water harvest, but is nonetheless significant and must be considered when discussing overall harvest.

Table 17. Estimated fall/ice fishing angler harvest, Kathleen Lake 1980 – 2004.

Species	2004	1991	1981	1980
Kokanee	0	8	48	33
Rainbow trout	0	0	0	0
Lake trout	22	63	282	140
Arctic grayling	0	0	20	29
Round whitefish	0	0	0	0

Fishery Sustainability

Based on the estimated productivity of the system, we estimate that Kathleen Lake could sustain a total annual lake trout harvest of about 299 kilograms and still maintain a high quality fishery (see Methods - *Lake Productivity*; average lake depth: 55.2 m, concentration of total dissolved solids: 172 mg/L, the average annual air temperature at the lake: -1.6 °C). Estimates of the sustainable yield are imprecise so we attempt to minimize risk and maintain fishery quality by using conservative estimates.

Anglers harvested 137 lake trout from Kathleen Lake over the summer and 22 in the winter (Table 18). Total fishing mortality includes the unintentional mortality of any released fish. Catch and release, when done properly, has a minimal impact on fish that are released; lake trout survival rates range from 93% for lightly handled fish to 76% for deep-hooked fish (YFWMB 1998). We used an average of 85% survival, which for the 300 lake trout released in the summer, results in an additional mortality of 45 fish for a total of 204 fish.

Telemetry data from lake trout in the Kathleen system indicate that some lake trout harvested in the Kathleen River belong to the Kathleen Lake population (MacKenzie-Grieve 2004). These data showed movements of lake trout from the lake into the river system, but cannot be used to determine what proportion of fish caught in the river originate from and are part of the Kathleen Lake population. For discussion purposes, we use 50% as the proportion, but acknowledge that this value is not based on data and we caution that strong conclusions cannot be drawn from these data.

We summed all of the known sources of harvest and mortality of lake trout from Kathleen Lake, including those from the Kathleen River (Table 18). There is no known subsistence harvest on the lake. Based on the average size of harvested fish, the weight of total lake trout mortality in the recreational fishery was 430 kg and is greater than the calculated OSY of 299 kg. Without the added harvest estimate from the Kathleen River, the total harvest and mortality drops below this level (to 273 kg), highlighting the importance of a precise understanding of the movements of lake trout within this system.

Because of this uncertainty, strong conclusions about the impact of the recreational fishery on lake trout in Kathleen Lake cannot be drawn. The level of harvest *may* be above the level recommended to maintain a high quality fishery. Another element of uncertainty is that the productive capacity of the river system is currently not being considered in our estimate of sustainable yield.

Current harvest estimates are significantly less than estimates from the early 1980s, when the optimal harvest was very likely exceeded. The fishing continues to be good in Kathleen Lake, indicating that historic fisheries have not significantly depleted the population. Given the uncertainties in understanding the sustainability of the current harvest, the cautionary approach is to continue to monitor both the lake trout population and the harvest. We recommend that further studies be done to determine the degree of mixing and movement of lake trout between Kathleen Lake and Kathleen River and to refine estimates of the productive capacity of the system as a whole.

Table 18. Minimum annual lake trout harvest by anglers (number of trout unless otherwise indicated), Kathleen Lake 1980 – 2004.

Trout Harvest	2004	1999	1995	1991	1990	1981	1980
Kathleen Lake							
Summer Harvest	137	184	69	n/a	53	400	223
Number Released	*300*	*185*	*44*	*n/a*	*37*	*48*	*21*
Catch & Release Mortality (15%)	45	28	7	n/a	6	7	3
Winter Harvest	22	n/a	n/a	63	n/a	282	140
Kathleen River							
Harvest	125	141	188	n/a	52	n/a	n/a
Number Released	*721*	*692*	*808*	*n/a*	*70*	*n/a*	*n/a*
Catch & Release Mortality (15%)	109	104	121	n/a	11	n/a	n/a
Harvest & Mortality of Lake fish in Kathleen River (50%)**	117	123	155	n/a	32	n/a	n/a
Total							
Harvest & Mortality	321	335	231	63	91	689	366
Mean Weight (kg)	1.34	1.20	1.04	1.37*	1.15	1.65	1.81
Total Mortality (kg) (Weight of Lake Trout)	430	402	240	86	105	1137	662

*no biological data available so the average mean weight for the other six surveys was used
** see text for explanation. 50% of the trout in the river are assumed to be from the lake.

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APPENDIX 1. 2004 Kathleen Lake angler harvest survey results: Comparisons between periods.

Effort

Mean daily angler effort was relatively consistent over weekends in the first three periods of summer, and increased across weekdays in the same periods. Minimal amounts of effort were expended in the late September periods (after Labour Day weekend). Highest daily effort was in the July weekend period, and no one was observed angling on survey days in the late September weekend period. Weekday effort was slightly higher than weekend effort in the August/early September period (Figure 1.1).

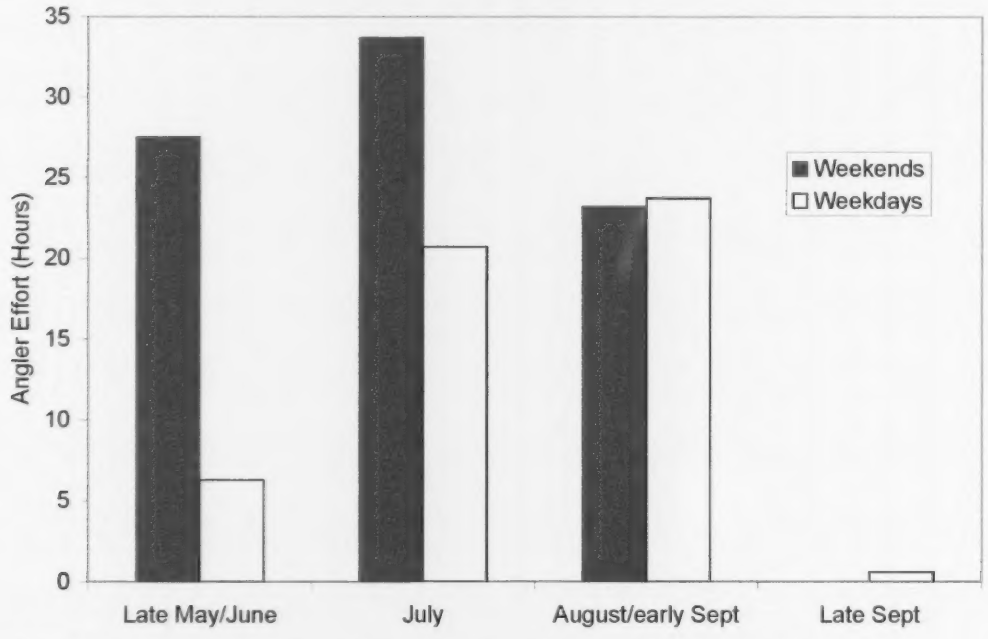

Figure 1.1. Estimated angler effort per day, Kathleen Lake angler harvest survey 2004.

Fishing Methods

Fishing methods showed consistent spin casting throughout the survey, with more trolling in the first half of summer, shifting to fly casting and combination methods in the later half.

Guided Anglers

Guided parties were represented in all periods other than July, with heaviest use in both August/early September periods.

Angler Origin

Origin of anglers was relatively consistent over the survey, with the exception of fewer Whitehorse anglers and more European anglers in the second half of the survey.

User Type

Day users were the dominant users followed by campground users in all strata but July weekends, where campground users were more prevalent. Private campground users only appeared in the late May/June periods, and the lake shore campers were on a July weekend.

Weather

The influence of weather on angling activity was not analyzed by period.

Catch

Lake trout CPUE was fairly consistent over the summer (Table 1.1). Typically in Yukon there is a decline in lake trout CPUE as the summer advances due to warmer summer water temperatures. This pattern was not evident in Kathleen and likely reflects the deep, cold water characteristics of Kathleen Lake. Arctic grayling CPUE was very "spiky" over the summer which is indicative of periods when anglers targeted this species. CPUE results for both species are considered good in the Yukon context. Other species were only targeted occasionally with little success, reflective of their low abundance in the system.

Table 1.1. Estimated catch per unit of effort (fish/hour) by period, Kathleen Lake angler harvest survey 2004.

Period	Lake Trout	Arctic Grayling	Rainbow Trout	Kokanee
Late May/June weekends	0.20	0.01		
Late May/June weekdays	0.15	0.23		
July weekends	0.15	0.04		
July weekdays	0.39	0.10		0.00
August/early Sept weekends	0.17	0.24	0.01	
August/early Sept weekdays	0.12	1.28	0.00	
Late September weekends				
Late September weekdays	0.00			